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The Philadelphia Meeting

Each year *The American Biology Teacher* attempts to bring its readers some of the highlights of the annual meeting. The condensed minutes and certain other items have already appeared. The new officers and the committee chairmen were included last month.

This month we include some of the contributions from the various program sessions. Some of these sessions were cooperative affairs, joint sessions of two or more of the cooperating societies, The American Nature Study Society, The National Science Teachers Association and The Cooperative Committee of The American Association for the Advancement of Science. Other sessions were held by the individual organizations.

It is obviously impossible for *The American Biology Teacher* to report more than a small part of these sessions. There were sixteen separate program sessions, not including demonstrations, field trips, luncheons, film previews and business meetings.

Some papers can be published just as presented, but many would be too long to print in full. If all were printed there would be considerable overlapping and near duplication.

Some of the most interesting contributions, such as the demonstration of root hairs devised by the elementary school pupils of Miss Flora Kahme, of Long Island, are in the nature of demonstrations. These cannot be transmuted into suitable magazine material.

We present this time the full or somewhat abridged text of three of the papers presented at the NABT program of December 29, together with a digest of a paper on a symposium of AAAS. Several other papers will be presented from time to time. To the extent that space permits and as the papers become available, *The American Biology Teacher* will attempt as full as possible a coverage of the Philadelphia meeting.

The opening program of the Philadelphia convention was a joint session of all the cooperating societies with president Dick Weaver of NABT presiding. The annual field trip, a joint project with ANSS, was held on December 30. It was a trip to the Pine Barrens of New Jersey and the Atlantic Coast.

Experimental and Laboratory Techniques*

B. BERNARR VANCE

Chairman of Sciences, Daniel Kiser High School, Dayton, Ohio, and Assistant Professor of Biology and Education and Critic Supervisor of Teacher Training, The University of Dayton and Wittenberg College

A traveler in the middle of The Sahara Desert was amazed to come upon a man in a bathing suit. "Where on earth are you going?" he demanded. "Swimming," replied the man. "But," said the traveler, "You're a hundred miles from the sea!" "Yes," replied the other, "Wide beach, isn't it!"

I believe, like the man in the bathing suit, that we teachers *do* have a wide beach before us, and that many of us are yet pretty far inland from where we can really plunge into the sea of true learning by meaningful observations, experimentation, problem-solving, and individually and group-planned research. Many school science departments have yet only scratched the surface of the shared-experience type of learning, where pupil and teacher both participate in becoming educated, gain new vantage points of scientific open-mindedness and functional learning, and explore together the charted and uncharted paths of science.

Yes, the beach *is* wide, but more and more teachers each year put on their swimming suits, and are making slow but steady progress toward the sea. We must shake off, as we go, the cloying sands of traditional academic ritualism, the sacredness of textbooks, the threat of district and state scholarship tests—which so often demand that our pupils become walking encyclopedias of biological facts and nomenclature, and by which all too often the "success" of teachers is measured—and our own natural tendency to teach as many of us were taught.

Early this fall a boy in one of my classes accidentally dropped a few grains of albino-segregating corn, with which he was doing some experiments relating to the influence of light on direction of growth, on some matted plants growing in a large aquarium. Within a few days, he noticed that the grains had sprouted, and were growing rapidly, with their roots hanging down in the water of the aquarium. From this observation, he started on a series of experiments and reference readings in soilless plant gardening, using a variety of seeds and experimental set-ups. Other pupils, working with him, noticed the "fuzz" on the corn roots in the water, and embarked on a study of root hairs and their structure and functions; others began experimenting with oxygen intake; others are since exploring the possibilities for growing albino corn plants to maturity through some method of intracellular feeding with dextrose. And so it goes—each year some seemingly routine experiment or clumsy accident becomes a stimulus for all sorts of project investigations for a large group; in fact, the ramifications of this accidental dropping of corn grains into the aquarium, have constituted almost a whole course in plant biology for us this year.

The use of indoor and outdoor laboratory activities in the teaching of biology is often greatly misunderstood by teachers. We may be convinced that "learn-

* An abridgment of a paper presented as a part of the program of The National Association of Biology Teachers meeting in Philadelphia, Dec. 29.

ing by doing" is a valid and workable basic principle of teaching, and so we place great importance on insect collections, blue prints of leaves, dissection of animals, the making of drawings and models—for which we may have very complete and detailed directions—and like activities which involve a great deal of manual work. Thus, we may make a great show of "learning by doing." Certainly we are making much of the first five letters of the word *laboratory*—LABOR—, and have less time for using the final seven—ORATORY! However, if the activity has no intellectual worth, we are pretty much wasting our time. It is intellectual activity, coupled with meaningful manual activity, which makes our pupils wiser and more effective in thinking, appreciating, feeling, understanding, judging, evaluating, accepting responsibilities, willing to withhold judgment until all available facts have been considered, and showing more and more the earmarks of a truly educated individual. There must be developed a genuine spirit of research and investigation, pupil planning and discovery, instead of imitation and blind following, or so-called learning never becomes functional in living.

Last year we found a need for colored charts. The set we had on plant anatomy was in black and white only. After mention was made in class of the desirability of a colored chart of the life cycle of ferns, a boy from our school football squad asked to work on the fern chart. His first question was, "What colors do *you* want on it?" Of course that was the time to say, "I don't know!" The idea filtered through that the type of fern from which the diagrams had been made would be the real source for a color scheme. This chap developed a lasting interest in microscopes, while doing the job, and as a result of his work

—Photo by J. R. Sisco

FIG. 1. A fern spore germinator, made by upturning an old flower pot filled with peat moss in a large dinner plate, beneath a glass battery jar cover.

with a huge old Boston fern borrowed from a neighbor, some clay pots, saucers, peat moss, and fruit jars, devised a set of fern spore germinators (Fig. 1) in which we have a group of little ferns growing now. What started out to be only manual labor of imitation culminated in intellectual ideas and originality.

I have come to believe more and more also that the best science teaching is often done, not by persons who know most all of the answers which pupils ask. Perhaps the best real teaching of biology, or any other science, is done by teachers who understand young people and the basic yet varying patterns of their physical and mental development, who know how to work with them, and who are willing and ready to say, "I don't know the answer to that, but I can help you find out." Teachers who know most all of the answers are often too eager to take the easier way out, *telling* the pupil the answer rather than aiding him in finding it for himself. It is in the

devious or simple process of arriving at an answer, or in failing to find an answer, that the most real learning is achieved, and our basic aims as science teachers are approached.

I recall distinctly that school day a few years ago when a man whose encyclopedic learning was astounding to behold, although he was only a mediocre success in his own profession, and who had been exceedingly disturbed a short while before upon finding no one in a class in commercial geography who could bound the Great Lakes (including the teacher, I suspect also), walked into one of my tenth grade classes in high school general biology and asked the pupils to define the word "biology." Not one pupil volunteered a definition, and I believe to this day he has me in his book as one of the slabs of "dead wood" in our city school system's log-pile! I was interested in the reaction of the class and, after the man had left the laboratory disgustedly without attempting to find out what we were trying to *do* together in this group, I asked one little girl why *she* didn't volunteer an answer. Her reply was even more interesting—"I wish he'd stayed an hour or so; we could have *shown* him what is biology; I couldn't just tell the man that biology is the science of life, because something as big as we've found this to be can't be put into such a short few words!"

This same girl was at that time doing a complete study of common molds and their products, and had already succeeded in isolating, pure-culturing, and identifying no less than twenty-two varieties of common molds. Among these, she had isolated *Penicillium chrysogenum* from a cantaloupe rind, a mold which one of the larger manufacturing drug companies announced a few weeks later as the most prolific producer of penicillin yet found. This same girl had worked out a method of pure-culturing by dilution from mixed mold spores, which was quite unorthodox and practical. She continued this project work in her spare time through her junior and senior years, went on to take charge of a university culture room during her first year in college, and then on to heading the technological laboratory of one of our city hospitals. I believe she knew then and knows now what biology is, not from memorizing and parroting back a textbook definition, but by experiencing and using biology. She had also, in the course of her experiments with molds, discovered several errors in the discussion of molds in her textbook.

We must not overlook the appreciation values of biology, as we do indoor and outdoor laboratory work. I once asked a successful business executive what, if anything, he recalled from his course in high school biology. He replied, "Only one thing! On a wintry day, when the snow was falling outside, our biology teacher laid aside a routine textbook recitation and read to us Lowell's 'The First Snowfall.' We then spent the rest of the period outside tramping through a nearby field and woodlot, observing what we could. A class discussion followed the next day which emphasized the effects of a heavy snowfall on plant and animal life, as well as the snow adding to the beauty of the landscape. I date from then my present keen interest in the winter resident birds, their names and habits, and their feeding as a hobby through the winter months."

There are, of course, those few teachers who have gone entirely overboard for field trips, experiments, projects, and other activity-type work alone, losing sight of the fact that, in order to become independent thinkers and problem-solvers, our pupils must have a broad fund of significant information with

which to form a background for thinking and reasoning. I am inclined to agree with Dr. Francis Curtis, when he says, "It must be realized that there is no method of teaching that is so likely to be poor as the best one we know, if we use it all the time to the exclusion of all others."

Quite frequently biology is the first course high school pupils contact which has possibilities for providing laboratory experiences. General science courses sometimes provide opportunities for laboratory work for seventh, eighth, and ninth year pupils in some schools, but all too often not and, if so, under poorly trained teachers. It would, therefore, seeem almost obligatory that teachers of high school biology make every effort possible to make the course a real shared experience, and a planned opportunity for the curious and already somewhat scientifically minded boy or girl to expand and grow in the ability to explore, plan, and carry through to completion individual project activities and experiments.

Here lies the opportunity also to encourage and promote future enrollment in the eleventh and twelfth year science offerings, or to continue more expanded opportunities in an advanced biology course.

There is also the known fact that a fairly large number of pupils drop out of school during or at the close of their sophomore year. For these pupils, it is vital that the biology course offer them experience in solving their own problems and developing individual responsibility, so that they may intelligently participate in adult affairs in this scientific age.

I come to believe more and more each year, that the only real biological training we provide, and the only scientific attitudes we develop in boys and girls of any school age, from the elementary school through graduate school, are those which relate directly to actual experience, or to as near simulated experiences as possible. I rely more and more each year on laboratory work, our pupils do a great deal more smelling and tasting, get their hands into a great many more messes, engage in more and more individual and group projects of diverse nature and results, and do less and less poring over books and lesson plans. Our room is a combined laboratory and classroom, with a great variety of home-made apparatus and common materials, a rather completely stocked museum—readily accessible at the rear of the room—and a fairly complete reference library of books, pamphlets, clippings, and photographs for enriching factual background as the need arises.

The need for and worth of such a plan was first made very real to me when I entered the high school field of teaching from a college instructor's job, to do some writing. I was assigned to a room with thirty-two folding chairs, a blackboard, a totally unusable set of technical charts detailing plant anatomy at about a graduate school level, six jars of beef extract, five pounds of agar-agar, a set of prepared microscope slides, and one ancient microscope. The biology classes of the year previous were taught in the balcony of the school auditorium, and so we were highly favored in having a room of our own.

Like the turtle that climbed a tree to escape a hotly pursuing alligator, who was breathing down his neck, we *had* to do something to build up a functional course in general biology. Looking back in retrospect, I believe that some of my most effective teaching was done in those days when we were all—both teacher and pupils—of *necessity* working together to make a biology laboratory course come into being. Some of the boys constructed rather efficient microscopes, using as lenses the curved tips of

flashlight bulbs, others collected and mounted for our prospective museum all sorts of native plant and animal life.

Two boys undertook the planning and construction of an observation beehive. They built the first one in their woodworking class, installed a colony of bees, and then found all sorts of changes necessary in design, location, and kind of bees most adaptable to an observation hive. Before the year was over, they redesigned the hive and built another. In their study hall time voluntarily the following year they stocked this hive with Caucasian bees, and again found changes to be made. The following year they built another hive, which is the one we now have in our laboratory, and the working construction plans for which are shown in Fig. 2. The boys now started beekeeping at home. One of them had twenty-two hives in his backyard, and made his bee business pay off enough during the depression years to see him through two years of college. He is now a successful Project Engineer with General Motors Corporation, and occasionally visits us and reminisces over his first successes and failures in scientific experimentation.

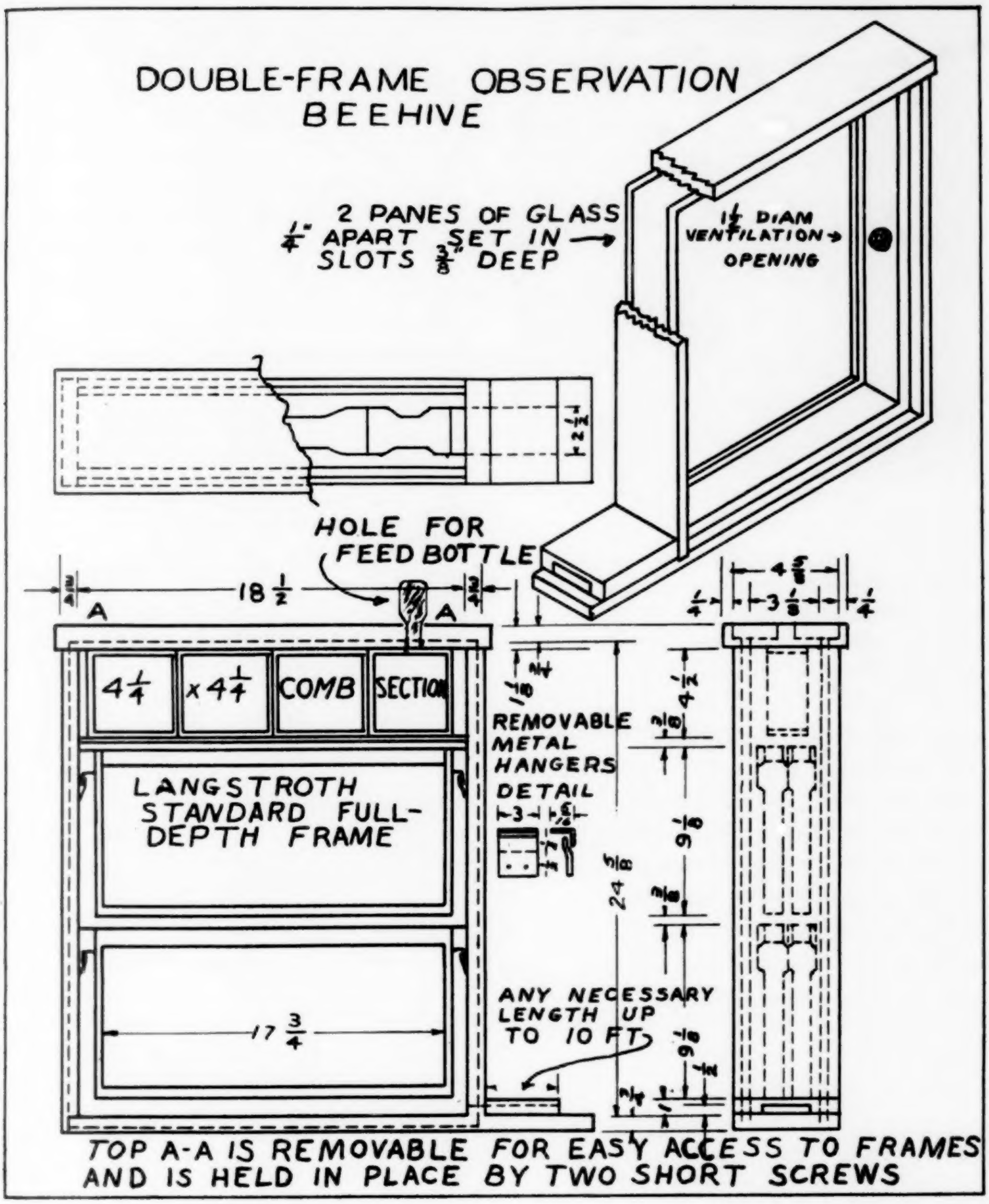
Practically everything we have in our biology room in apparatus, demonstration materials, charts, displays, slides, microscopes, paintings, projectors, and the like—except the furniture and fixtures—are the result of pupils' productive activities over the years in connection with some phases of biological study. They often leave behind, as a contribution, some piece of homemade apparatus, museum specimens, collections, models, and the like as aids to pupils coming along later. Besides the meaningful learning activity at the time, we have a selfish interest in these pupil projects; each pupil seems to take pride in leaving behind some evidence that he or she was enrolled in our school's biology course.

Pupils have constructed a miniature "greenhouse" (Fig. 3), using five glazed window sash. It has an electrical resistance heater-bar, wired somewhat crudely beneath a shallow water pan. The pan contains water-soaked pieces of soft bricks, which supply moisture for a high relative humidity inside the case. We use a homemade thermostat for temperature control. The case has a slatted rack for potted plant cuttings, seed germination tests, water cultures, etc. A growing orchid plant, which we keep in the warm and humid case throughout the year, blooms each year (Fig. 4) in mid-November. Our small laboratory fees paid for the materials which had to be purchased to build the "greenhouse."

As a result of pupils experimenting with bacteria, we have two homemade bacterial incubators, for each of which we purchased only two $0.25 ether wafers for the thermostat assemblies, scrap

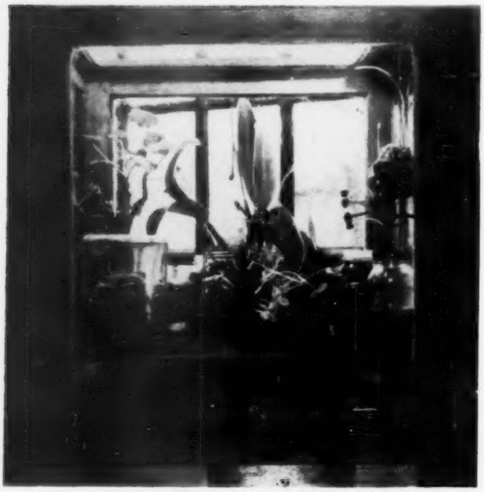
FIG. 2. A narrow board can be fitted under the raised lower sash of the laboratory window, with an opening cut in it to receive the hive entrance. Or a metal funnel may be fastened to the hive entrance, and a section of old garden hose attached to it and run through a hole drilled in the window sash. This allows for the hive to be placed at most any distance from the window. If a hose is used, a flat piece of metal should be fastened just below the outside opening of the tube as a landing, and another piece just above that for protection from rain and snow. The back of the hive should be slightly higher than the front to prevent water running back into it. The screened opening at the rear of the hive is handy for introduction of a queen. The hive is best located on the south or east side of the room.

A stock of bees can be gotten from a local beekeeper, or purchased by the pound from a commercial apiary. The introduction of a new queen into the hive is interesting and instructive. Directions may be given on the package



—Diagram by Forrest Whitescarver

in which she is shipped, or may be found in beekeeping books. The bees may need to be fed during the winter months. Fill the feeding bottle shown with strained honey, or thin cane sugar sirup, and invert the bottle in the opening shown. A small nail hole should be punched in the bottle cap to allow the bees to take the sirup only as needed. An interesting variation of the usual comb structure in the hive is to cut the brood cells in one lower frame into strips, and set them crosswise so that the sides of the outer cells lie directly against the glass. Contrary to what is commonly reported, the queen will lay eggs in these cells, and the young bees can be observed in all stages of development from egg to adult.



—Photo by Sue Neff and J. R. Sisco

FIG. 3. A homemade miniature "greenhouse," constructed of five glazed window sash, with an electrical heater-bar and humidifier water-pan beneath the slatted rack. The homemade thermostat, at the right, can be set for the desired temperature, and the top sash raised or lowered to control humidity.

wood, glass and hinges for the doors. Our dissecting needles are made from discarded odd lengths of glass tubing from the chemistry laboratory, fused around used darning needles. Our dissecting pans are old baking tins with a mixture of paraffin, beeswax, and lampblack in the bottom of each. Insect collecting nets are made from wire coat hangers, cheesecloth, and broomhandles. Most of the rest of our equipment is of similar origin.

We have our own workbench, miscellaneous tools for repair work, an ancient but quite usable electric refrigerator donated to us by a downtown department store for the cost of transporting it to the school, and an old-time electric stove whose oven does amazingly well for dry heat strilization. Animal cages are designed by boys working in the sheet metal shop. Live plants and animals are brought in by pupils; almost always we can contact former pupils in other parts of the country or abroad for biological materials not to be found nearby. Models are contrived from all sorts of odds and ends, and museum jars from assorted fruit containers. There is no lack of materials or apparatus when we intelligently substitute what is available for that which is beyond our means or out of our range.

In conclusion, may I suggest that the following matters, which concern labora-

—Photo by Charles Bass

FIG. 4. A tropical orchid blooms each year in the miniature "greenhouse."

tory and experimental techniques and attitudes, should be held as goals in the minds of science teachers, from the elementary grades through the colleges:

1. That we can assume that young people in our schools today, at any grade level, have more of a factual background, desire, and need for science instruction than at any time heretofore. It does not necessarily follow, however, that they have had even as much opportunity to experiment and explore for themselves outside the school as in earlier times. This situation calls for an upgrading of science offerings throughout, enlarged

laboratory facilities and field opportunities, and increased emphasis on the intellectual aspects of "learning by doing."
2. That "cookbook" type experiments and teacher-planned demonstrations be reduced to a minimum or discarded, and pupil-planning and individual and group research project activity be fostered, stimulated, and promoted wherever possible.
3. That science instruction be started as early as possible, while young people are yet open-minded, inquisitive, and interested in finding out the how and what of things around them.
4. That a shared-experience type of science instruction be planned and organized as an integral part of the program of studies in all elementary schools, and carried on through the whole of the learner's formal schooling.
5. That at least one year of a laboratory-type natural science course, and one year of a laboratory-type physical science be required for graduation from high school.
6. That the facilities of our science laboratories, no matter how meager, be made available at all times of the school day for pupil use, under competent guidance, much as the school and public library are available for reading research.
7. That we all place increasingly greater emphasis on in- and out-of-school shared laboratory experiences, and on individual and group experimentation, planned and carried through by the individuals or groups themselves to the greatest extent possible.
8. That we, as teachers, make every effort to develop as fully as possible in as many of our learners as possible, and to a greater degree within ourselves, those qualities of open-mindedness, critical thought, tolerance, flexibility, personal responsibility, creativeness, and discerning judgment which can only come about as a result of experience and experiment, and which are necessary for both intelligent leadership and followership, as well as being true stabilizing influences in economic, social, and religious life in these confused times, as they have been and will continue to be in all ages.

The Biology Teacher's Responsibility to Society*

WALTER P. TAYLOR
Chairman, Standing Committee on Education, The National Wildlife Federation

If any relatively small group of human beings has attracted more attention, and given rise to more feelings of consternation on the one side and appreciation on the other than the atomic scientists, I'd like to know who they are. In many ways these shrewd and able workers with fissionable materials have set an example for the rest of us. For one thing, they seem to have been unusually far-sighted in assuming a certain social responsibility for the application of the results of their studies. As a result of their realistic facing up to some of the possible results of use of the atomic and now hydrogen bombs, we are in a far better position to anticipate what may happen, to guard against threatening dangers, and to promote beneficial uses of the new discoveries.

Perhaps, as teachers of biology, we may well take a leaf from the notebook of the atomic scientists. Obviously we biologists should be no less concerned with the applications of our findings than are the physicists with theirs. I

* An abridgment of a paper presented as a part of the program of the annual convention of The National Association of Biology Teachers in Philadelphia, Dec. 29.

think also we may concede, being biologists ourselves, that we should be able to do a better job than most others in acquainting the general public with biological facts and principles.

But perhaps someone may say that the fields dealt with by biologists and by the atomic scientists are essentially different. In the one case we deal with living materials which, while undoubtedly of interest, may be taken for granted. In the other, we are concerned with matters of life and death associated with permutations and combinations of an explosive character. It is reasonably certain that every biology teacher realizes that this view is incorrect, that biological phenomena cannot be taken for granted, that they possess profound significance and that they deserve at least as much attention as we give the atomic bomb. Let us, however, for the sake of the record, examine just three of these vast and important biological fields in which public interests are paramount.

Sex and Human Society

Referred to by Professor William E. Ritter as that *imperium in imperio* of human concerns, the relations of the human sexes are still of consuming interest and significance to every normal human being, as well as to society as a whole. What of the family, present and future? It is a matter of congratulation to all that conscientious efforts increasingly are being made by responsible researchers to supplant baseless assumptions, the folk-lore, the misleading traditions, the hush-hush, and the misinformation so widely prevalent, with honest information as to exactly what the facts are.

The point here is that sex is primarily a biological matter. Lawyers, ministers, and politicians have done much in this field, but adequate human handling of the problems involved simply cannot be anticipated in the absence of fundamental biological treatment.

Do we, as teachers of biology, have a responsibility in this matter? The question needs only to be asked to carry the unmistakeable answer. Here I ought to point out, perhaps, that we do not know all the solutions! I am merely pleading that we biologists, specialists with the biological concerns of the world, should recognize and assume our obvious responsibility to deal in a forthright manner with these difficult but important problems.

Human Population

Closely related to these problems of sex are those of human population in which, currently, there is increased interest. All of us know that, at least since the time of the gloomy English philosopher Malthus, there have been those who forecast over-population and trouble. On the other hand there has been a disposition on the part of some magazine writers, columnists, chambers of commerce, and boosters generally to minimize the significance and applications of the Malthusian doctrine. Familiarity on the part of biologists with the almost irresistible urge toward multiplication known as biotic potential, in every living species including our own, has convinced many of us that we must face the problem of human population far more realistically than we have ever done in the past.

For we human beings have waxed great and multiplied. We have climbed from a paltry half billion individuals 300 years ago to well over 2,000,000,000 today. Fortunately our food productive capacity has increased also, so that probably a greater proportion of persons are well fed and well clothed than at any previous period in the world's history. Even so, the late Dr. H. G. Bennett, President of Oklahoma A and M College, who up to the time of his tragic death was in charge of the administration of the Point Four Program for the

United States Department of State, pointed out that if all of the available food in the world were gathered into a huge stockpile, and all the people of the earth were brought together to feed on it, there would probably not be enough for more than two-thirds of those present!

When we consider that, at the present rate of increase, only 200 more years would be required to reach a population of nearly 9,000,000,000 persons, and only 1,600 years to build a population such that there would be a living human being for each square yard of the earth's habitable land surface, we may well pause and ponder.

Obviously, if our biotic potential keeps up, all the prowess of all the production experts will scarcely avail to prevent our ultimately becoming slaves to shortages. And, as slaves to shortages, we are likely to lose our high standard of living, our democratic way of life, and our free world. The veneer of civilization is thin at best. A hungry people becomes a desperate people. The peoples of our western civilization cannot be expected to accept the starvation and death, which constitute Nature's way of handling overpopulations, without fearful and tragic protest.

These are things to think about. What can be done? Plenty, if we are willing to do it. Who will guide us? No one man—probably no one group. Our combined wisdom is needed to meet the issues. Note, however, that in all decisions having to do with biological matters, the teacher of biology should occupy a peculiarly strategic position.

Conservation of Natural Resources

It is a bit discouraging that, with all of our talking, writing, and conferring, the problems of conservation are but dimly appreciated by the people. Oh yes, there is general approval of conservation measures, if they don't mean increased taxes; especially, be it noted, in country areas. The need is not so clear in the cities. I do not have to point out to you that a proper handling of our natural resources, renewable and non-renewable, is of an order of importance at least equal to that attached to the atomic bomb, whether in city or country areas.

As already shown, the people of our nation have been alerted to the dangers of the atomic bomb, largely through the enlightened efforts of the atomic scientists. Even more insidious, in terms of their long-time effects on the nation and on humanity as a whole, are practices which result in the waste of our natural resources. Like the bobwhite quail, man himself can be eliminated from an area without firing a shot. All you have to do is to remove his food and cover—in short, his habitat. That's what improper land use does. A half dozen of our states have lost population in the last several years, certainly in part due to depletion of soils and associated natural resources. Unfortunately the people generally are not alerted to the dangers of depletion. The threatening aspects of the situation are less sensational and less obvious than in the case of the atomic bomb.

Biology teachers have a tremendous responsibility and opportunity to inspire enthusiasm for realistic dealing with this situation on the part of their pupils and students, and the general public as well. Fortunately, aids for the proper presentation of these conservation problems are more numerous and more effective than ever before. The work in this field of the National Association of Biology Teachers, and other organizations, is expanding. Among these friends of the future are the American Nature Association, the National Audubon Society, the National Committee on Policies of Conservation Education, the Wildlife Management Institute, and numerous other national, state, and local bodies,

with even a few international groups. Notable is the increase in the number of teacher organizations actively interested.

The effective work of a number of federal bureaus should receive mention here. These agencies include, among others, the Fish and Wildlife Service, the Soil Conservation Service, the Forest Service, and the National Park Service. The National Wildlife Federation, over a number of years, has been vitally concerned, and is now in better position than ever before to serve you and the general public in this field. With its service leaflets, its conservation releases, its tape recordings, its lists of films and books on conservation subjects, its stamps, its calendars, its grants-in-aid, its conservation fellowships, its bulletins and books, including the "My Land and Your Land" series, "Man on the Landscape," "Wildlife in Color," and a new book soon to be published, "Top Soil and Civilization," the organization is more favorably situated to assist than in the past.

Biologists Should Be the Best Interpreters of Biological Data

Note that I do not say that the job of the teacher of biology, in respect to assuming his proper role in relation to society, is always a light, pleasant, or easy one. Sometimes, indeed, it may be tough and difficult. Nevertheless, the situation should be realistically faced and aggressively dealt with. After all, is there any good reason why biologists should not assume responsibility for finding and knowing the facts in their field, and for interpreting them for the use of the public? Is it possible that the failure of our legislatures, Congress, and the school boards and boards of regents to deal adequately with conservation and other biological concerns is the result, in part, of ineffective teaching?

Years ago William Morton Wheeler complained that biological instruction did not seem to be as effective as it should be. In spite of the exposure to biological instruction of a sizeable proportion of our people the general public seemed to Professor Wheeler to be very little informed or influenced.

The same phenomenon is all too obvious today. It is strikingly illustrated in a number of ways. For one thing, look in your pocketbook. Biologists appear to be less well paid, throughout our society, than the physicists, chemists and engineers, not to mention some other groups. Then look into your laboratories and libraries. Biologists seem to have a great deal of difficulty, as compared with some others, in securing the proper equipment, books and travel funds to do a good job of research and teaching. Then take a long look at our ultimate governing bodies, Congress, various Boards of Regents and overseers, state legislatures, county boards, school boards, town councils, etc. The thinking of most of these bodies is far more legal or economic than it is biological, even when the problems under study are strictly in the biologist's field.

When you stop to think of it, our very survival may well depend on a proper application of this information. How little does our present day society realize this! Perhaps we ourselves do not sufficiently appreciate the far-reaching importance of some of our possible contributions. Whether we like it or not, whether we see it, whether or not we do anything about it, our responsibility to society, as biologists, is a very real thing. If we do not assume it some other individuals and groups with far lesser qualifications will fill the gap.

Biology is not just another subject to be studied in school. Biology is national defense, biology is our high standard of living, biology is our social and economic welfare, biology is the survival of our democracy.

The Interpretation of Science Through Press, Schools and Radio*

WATSON DAVIS
Director, Science Service, Washington

We live in an age of such astonishing wonders and such plentiful conveniences that we are likely to forget the long and painful cultural evolution that has brought us to modern civilization with all its hopes and dangers.

Science and technology are responsible to an amazing degree for the kind of world in which we live. In one sense, too little scientific knowledge, understanding and application has given us a divided, schizophrenic world. The world's astounding advances in physics, chemistry, biology, medicine and psychology have served Nazis and Communists bent on ruthless conquest. This anti-social use of science and technology has the danger of neutralizing the multifold benefits that have come to what we believe to be the more rational, humane and civilized part of the globe. It is no ultimate gain to save a life through penicillin only to have it wiped out by atomic radiation.

Implicit in the dissemination of science and its method to all the people is the belief that if the people know the truth it will not only keep them free but allow them to act intelligently in the conduct of their social and personal lives.

Appreciation of science interpretation has become keener with the practice of the years. The First World War awakened the first effective realization on the part of scientist and journalist alike that science is both important and news.

Science Service was born of that union, three decades ago. It demonstrated, by operating, by producing copy that newspapers wanted and used, and still want and use.

A statement of the purposes of Science Service, which is that of all science interpretation, is just as fitting today as it was in 1921:

"In a democracy like ours it is particularly important that people as a whole should so far as possible understand the aims and achievements of modern science, not only because of the value of such knowledge to themselves but because research directly or indirectly depends upon popular appreciation of its methods. The specialist is likewise a layman in every science except his own and he, too, needs to have new things explained to him in non-technical language. Scientific progress is so rapid and revolutionary these days that no one can keep up with it without some means of keeping in close contact with its new ideas and discoveries."

This was before radio broadcasting, before electronics, before hormones, before miracle drugs, before the vitamin era, before commercial air transport, long before atomic fission and jet engines, radar and TV. We hoped that the last war had been fought.

In a very real sense, there is more need of taking science to the people than ever before. You can always get a headline with a cure or a new weapon. You can use such reportorially golden words as cancer, atomic, sex, love, polio, death, and other emotionally rooted terms. This is a minor facet of science.

Most of the people are amazingly sci-

* Digest of a paper in Symposium at meeting of the American Association for the Advancement of Science, Philadelphia, Sunday, December 30, 1951.

entifically minded and straight thinking. This makes democracy work. We are confident of democracy for this reason. Our big job is to give them the background, the information and the experience of science upon which they can build their lives and the world.

The newspapers have the heavy responsibility, which in general they are fulfilling, of telling of the current progress of science so that it can be understood and applied. Science and technology constitute a field of news and feature more important basically than crime, politics, and war. It takes better writing and more knowledge to make the technical story show its throbbing human interest. For science must be understood emotionally as well as intellectually if it is to be effective, both in public effect or in holding newspaper readers.

Newspaper publishers and editors have the responsibility of giving their readers the same kind of competent coverage of science that they give other fields of news. This means the utilization of competent national and international coverage of science news, and the providing of local coverage of health, industry and educational institutions from the science standpoint. More and more newspapers are utilizing reporters of competent technical training in their coverage of the science beat.

Radio, with the power of the spoken word, and television and motion pictures which add sight to sound, have paid attention to science, less so now than in radio's early years. Despite their educational potentialities, they are primarily entertainment and news media. Radio and TV have the faculty of bringing scientists with their effectiveness and limitations directly to the laymen "in person," as it were. Fortunately there has disappeared the early tendency for an actor to impersonate a scientist on the radio and present him as a conventional stereotype. I have been particularly interested in introducing to the CBS radio audience nearly a thousand scientists who say what they want to say as they want to say it in their own voices. The future of science on radio and TV is largely dependent upon what time on the available channels is left over from the increasingly strident entertainment and advertising.

All this reading about science in newspapers, magazines, and books or hearing and seeing it on radio and TV is spectator science. So, unfortunately, is much too much of our science teaching.

It is more difficult to participate in science than just to read about it. It is terrifically important that many of us have actual experience in science. This can best be done during the school years. For this reason in the interpretation of science, the science clubs, largely conducted as an adjunct to the secondary schools, take on such importance.

In the science clubs, many who otherwise would not have an experimental acquaintance with science have this satisfying opportunity. Over the years, millions, who do not and should not become scientists and engineers, experience science as a hobby, to their personal benefit and to the enrichment of our national policy.

The science youth movement (for that is what it is) has the other important function of allowing the discovery of those boys and girls capable of being the scientists and technologists of the future. The young person with talent often discovers himself through the excitement and satisfaction of tackling a scientific problem, experimentally.

What grass roots are to agriculture, science clubs are to science education. These bands of boys and girls are a perpetual youth movement, constantly renewed by the innate and undulled curiosity and exploratory spirit of those who

are discovering, through doing, the world about them.

The foundations of this great movement have been built in the youth activities of Science Service's Science Clubs of America. There are more than 10,000 affiliated clubs—in every state—and almost every county, city and town of the land. A third of a million members are on the rolls of these clubs.

State science academies, colleges, teacher associations, museums, newspapers, and other organizations are cooperating. In 32 of the 48 states, there are statewide movements as a part of the Science Clubs of America development. In some of the larger states there are regional organizations as well.

The National Science Talent Search for the Westinghouse Science Scholarships is now in its 11th year. This is a nationwide selection of the high school seniors who are most likely to be creative scientists of the future. The selections are made through a vigorous competition based upon results of science aptitude examinations, recommendations, evaluations and science project reports. In all, 3,000 boys and girls have been picked for honors.

Books that summarize and put in order the progress in a field and the inclusive type of review article in technical magazines serve an essential purpose. But access to the original literature is always necessary. Only the larger libraries can hope to give access to all the literature and even they must specialize. A particular library can hope to provide completeness only in selected fields. Thanks to photographic methods of copying, it is possible for any one library to service the whole world with the original literature on its shelves. Microfilm and photographic enlargements from microfilm or other photocopies are now an essential part of reference and library work. It should be possible for any researcher to have the record of the past on his laboratory desk.

The world has not yet learned to cooperate sufficiently to create one big library out of its rich and expansive literature resources, although it has the tools to do so. There is no one place to which a copying request can be sent with the assurance that the literature will be ferreted out and delivered as fast as airmail can carry it. Since dollars are being spent on elaborate literature schemes today where fractions of pennies were spent two decades ago, this does not seem to be too much to ask. The military's scientific literature activities must not hide behind the cloak of classification (in the secrecy sense) because if they serve the open and free needs of research they will build our future defenses most effectively.

In the publication of original research reports, our overburdened journals and institutions can utilize the auxiliary publication scheme pioneered by Science Service and operated by the American Documentation Institute. A single copy of the material is deposited, assigned a document number and prices for microfilm and photocopy reproduction on demand and the journal then publishes this information with title, author, etc., in order that anyone may obtain the document.

The broad expanse of science interpretation, through many channels, has one common denominator. It is directed toward having the people understand science to the greatest extent possible, with an accent upon participation.

Modern understanding of science might take the form of a great experiment movement in contrast to the worship of great books. This does not mean that books are not useful. The great, historic books are important. But books are static. Science and our civilization are

dynamic. Books, like timetables, must be subject to change without notice. Faith for faith's sake must give way to the healthy and inquiring skepticism which has created so many great discoveries.

If we contemplate in too great detail the growing volume and complexity of scientific research and knowledge, we may have a feeling that the task of telling the world about it is almost impossible.

The scientist himself has the responsibility of helping the interpreter to cut through the necessary seeming mazes of blind alleys and inviting paths so that the common man can see the promised goals beyond. It is a great and endless adventure, thrilling to tell and know.

Subject Combinations of California High School Biology Teachers, 1949–1950*

LEO F. HADSALL
Fresno State College, Fresno, California

Two of the more important factors determining effective high school biology instruction are the adequate training of biology teachers by professional schools and the assignment of subjects to biology teachers by secondary school administrators. Staff members of institutions preparing candidates for high school biology teaching are properly concerned that their students be amply grounded in subject matter which they will be called upon to teach and that they acquire basic skills in modern educational methods.

In order to train biology students satisfactorily for secondary school positions it is necessary to know in some detail the nature of the positions in which they are likely to serve. This study was undertaken to reveal some of the subjects which graduates of California state colleges would be called upon to handle. It summarizes the subject combinations of all California high school biology and life science instructors for the school year 1949–1950. The data were obtained from the 1949–1950 number of the California School Directory. Each California high school principal supplies for inclusion in the Directory the name of each secondary school teacher on his staff together with the subject assignments of each instructor. Unfortunately the data do not include the number of sections in each field, nor the student load in each subject. However, the data are sufficient to indicate that further consideration should be given to the certification of teachers and to current practices of teacher training if California high school biology students are to have satisfactory instruction in the life science area.

California high schools vary considerably in size. In 1949–1950 their enrollments ranged from 11 to 5,724 in 406 high schools employing 1454 science teachers. Only five high schools had enrollments greater than 3000; hence for the purposes of this study the schools have been grouped in classes of 500 students or multiples thereof up to 3000. The additional five schools have been treated as over 3000. Almost half of the schools had enrollments of 500 or less with a mean enrollment of 231.8 students (Table I).

* Presented at the Annual Meeting of the National Association of Biology Teachers, Philadelphia, December 29, 1951.

TABLE I

Distribution and Enrolments of 406 California High Schools Employing Science Teachers, 1949–1950

Enrolments	No. of schools	No. of counties	Maximum enrolment	Minimum enrolment	Mean enrolment
1–500	201	55	495	11	231.8
501–1000	85	35	991	509	717.5
1001–1500	41	22	1500	1001	1217.1
1501–2000	36	12	1927	1508	1693.4
2001–2500	27	8	2449	2010	2231.6
2501–3000	11	5	2932	2618	2781.5
3001–plus	5	3	5774	3007	4308.0

Many of the graduates of the California state colleges find ther initial employment in the smaller high schools. Moreover 40.9 per cent of all California high school science teachers are employed in high schools with enrollments not exceeding 1000 students (Table II). The subjects handled by science teachers in schools with enrollments not exceeding 1000 students are therefore of especial interest to those concerned with teacher training.

The term life science has acquired some significance in California. Biology is also referred to as the science of life or living things so it may be well to note the distinction.

Courses listed under life science are typically more elementary than customary biology courses. In most instances greater emphasis is placed on health education in life science courses than in customary biology courses. In some instances health education content may constitute as much as 70 per cent of the course. Life science has attained more recognition in high schools with enrollments exceeding 1000 students. It has received greater emphasis in urban areas.

The combination of biology and life science has maintained more stable status throughout California high schools than either chemistry or physics (Table II). The number of chemistry instructors rather closely approximates the number of biological science instructors in schools with enrollments under 500, then like physics drops off in the larger schools (Table II).

Since course load is an important factor in determining effective instruction, the Directory was carefully screened to

TABLE II

Distribution of 1454 California High School Science Teachers, 1949–1950

Enrolments	Number	Biology & Life Science	Chemistry	Physics
1–500	315	53.7%	52.4%	35.2%
501–1000	279	42.3%	29.0%	26.2%
1001–1500	213	44.6%	24.4%	13.1%
1501–2000	259	43.2%	15.1%	13.9%
2001–2500	237	46.8%	14.8%	14.3%
2501–3000	110	42.7%	15.4%	11.8%
3001–plus	41	48.8%	12.2%	9.8%
	1454	46.1%	28.4%	21.2%

TABLE III

Number of Subjects Taught by Each of 671 California High School Biology and Life Science Teachers, 1949–1950

School enrolments	No. of science teachers	Number of subjects taught by each teacher							
		1	2	3	4	5	6	7	8
		%	%	%	%	%	%	%	%
1–500	169	2.4	11.2	27.8	34.8	15.5	7.7	0	.6
501–1000	118	22.9	49.1	24.6	3.4	0	0	0	0
1001–1500	95	43.2	40.0	15.8	1.0	0	0	0	0
1501–2000	112	30.3	42.0	27.7	0	0	0	0	0
2001–2500	110	40.9	45.5	11.8	1.8	0	0	0	0
2501–3000	47	53.3	44.6	2.1	0	0	0	0	0
3001–plus	20	50.0	35.0	15.0	0	0	0	0	0
	671	27.7	35.8	20.7	9.8	3.9	1.9	0	.2

determine the number of subjects taught by each of the 671 California biology and life science teachers, 1949–1950 (Table III). More than half of 169 teachers in schools with enrollments of 500 or less taught four or more subjects. Twenty-eight per cent of the 118 teachers in schools with enrollments ranging from 501 to 1000 taught three or four subjects.

Wright, reporting on subjects taught by biology teachers in third class school districts of Pennsylvania, 1945, points out that "two subjects were taught by 115 teachers or 53.00 per cent of the biology teachers. Three subjects were scheduled for 30 teachers or 13.82 per cent of the biology teachers. Four subjects were taught by five teachers or 2.30 per cent of the biology teachers. Five subjects were scheduled for two teachers or 0.92 per cent of the biology teachers."[1]

It would appear that California school administrators have not been as successful as Pennsylvania school administrators in limiting the number of subject assignments for high school biology teachers.

In addition to the number of subject assignments the variety of assignments is pertinent. (Table IV.) On this basis it would seem that a biological science major with a general science or physical science minor would be well qualified for a California secondary school position.

The solution is not that simple (Table V.). More than half of the 671 biology and life science teachers received assignments in fields not closely related to science. Seventy-two different high school courses outside the natural science fields were included in this variety of assignments. In addition 38 of the 671 instructors were responsible for some form of secondary school administration.

This condition is possible because the California General Secondary Credential authorizes the holder to serve as a teacher in grades seven through fourteen. It is issued by the California State Department of Education. It does not limit the fields within which the teacher may serve.

The specific requirements for this credential may be summarized as follows:

The applicant for this credential must hold a bachelor's degree from a four-year college

[1] Wright, William Albert Earl. "Subjects Taught by Science Teachers in Third Class School Districts of Pennsylvania," *School Science and Mathematics*, January, 1945; pp. 45–51.

TABLE IV

Science Subject Assignments of 671 California Biology and Life Science Teachers, 1949–1950

Subjects	High school enrolments							
	1–500	501–1000	1001–1500	1501–2000	2001–2500	2501–3000	Over 3000	Total
Biology	161	102	56	60	53	27	12	471
Life Science	9	21	45	55	59	21	8	218
Botany	0	0	4	2	4	0	0	10
Forestry	1	1	0	0	0	0	0	2
Horticulture	0	1	0	0	0	0	0	1
Zoology	1	4	2	1	1	1	0	10
Natural Science	0	0	0	0	0	2	0	2
Physiology	2	10	10	10	20	4	2	58
Health Education	5	6	4	2	6	0	0	23
Chemistry	63	14	6	9	10	1	6	109
Physics	49	7	3	6	4	2	3	74
Radio & Electricity	2	2	0	0	0	0	3	7
Physical Science	0	0	2	0	2	0	0	4
Adv. Phys. Science	3	1	0	2	0	0	0	6
Senior Science	3	1	0	0	0	0	0	4
Geology	1	0	0	0	0	0	0	1
Earth Science	0	0	0	0	1	0	0	1
General Science	86	24	6	11	10	5	9	151
Everyday Science	0	0	0	0	2	0	0	2
Modern Science	0	0	0	0	0	0	1	1
Practical Science	0	1	0	0	0	0	0	1
Household Science	0	1	0	2	1	0	1	5
Girl's Home Science	1	0	0	0	0	0	0	1

and have completed thirty additional semester hours of postgraduate work of upper division or graduate level. This postgraduate work shall include six semester hours in professional education courses, and six semester hours in subject fields commonly taught in junior and senior high schools.

Forty semester hours of general education with a minimum of six semester hours in each of the following four areas shall have been completed during the five-year program: (1) science and mathematics, (2) the practical arts and fine arts such as arts, music, homemaking, health education, physical education, industrial arts, and similar fields, (3) social studies, (4) the communicative arts such as languages, literature speech arts, and similar fields.

Twenty-two semester hours of professional work in education shall include the following areas: (1) the scope and function of the secondary school, (2) growth and development; the learning process; mental hygiene or personality development, (3) counseling and guidance, (4) curriculum; methods; evaluation of instruction at the secondary level, (5) six semester hours of directed teaching. At least one-half of this requirement shall be completed by teaching any grade from seven through twelve.

Successful teaching experience in public schools or in private schools of equivalent status may be substituted for directed teaching at the rate of one year of full-time teaching for one-half of the requirement.

One major and one minor, in teaching fields commonly taught in California senior or four-year high schools, or a major in a field not commonly taught and two minors in acceptable teaching fields shall also be completed. The minimum requirements for a major shall be thirty-six semester hours, of which twelve shall be upper division or graduate work. The minimum requirements for a minor shall be twenty semester hours. Majors and minors shall be selected from the fields of:

TABLE V

Subject Assignments of 671 California Biology and Life Science Teachers, 1949–1950

Subjects	High school enrolments							
	1–500	501–1000	1001–1500	1501–2000	2001–2500	2501–3000	Over 3000	Total
Agriculture	3	3	1	0	1	0	3	11
Art	8	3	2	2	2	1	2	20
Audio-visual Aids	2	1	5	4	0	0	1	13
Biological Science	172	129	107	118	117	49	20	712
Commercial	15	3	0	0	0	0	0	18
Driver Education	7	1	2	0	0	0	0	10
English	10	4	2	1	0	0	1	18
Foreign Language	7	0	0	0	1	0	0	8
General Science	87	26	6	13	13	7	11	163
Health Education	5	6	4	2	6	0	0	23
Home Economics	9	1	1	1	2	0	0	14
Industrial Arts	8	2	0	0	0	0	0	10
Journalism	3	0	0	1	0	0	0	4
Library Science	6	0	0	1	0	0	0	7
Mathematics	75	12	4	13	2	1	3	110
Music	4	1	1	0	0	0	0	6
Physical Ed. Men	39	4	4	5	7	1	1	61
Physical Ed. Women	9	2	2	0	1	0	0	14
Physical Science	121	25	11	17	17	3	12	206
Physiology	2	10	10	10	20	4	2	58
Social Science	23	8	0	6	0	0	0	37
Speech	0	0	0	0	1	0	0	1

(1) Social studies

(2) Life science and general science. Life science or biology; physics and chemistry or general physical science; and additional preparation in one or more of the life sciences to complete the major.

(3) Physical science and general science. Physics and chemistry or general physical science; life science or biology; and additional preparation in one or more of the physical sciences to complete the major.

(4) English

(5) Speech

(6) Language arts

(7) Foreign language

(8) Mathematics

(9) Health Education

(10) Special fields including agriculture, art, business education, physical education, homemaking, industrial arts, librarianship, music, and speech arts.

Unless individual colleges hold their requirements for graduation above the level set by the State Department of Education, an applicant for the general secondary credential may receive approval and be assigned high school biology by a California school administrator if he has completed the minimum of six semester hours work in college science and mathematics combined. This would not have to include a single course in college biological science.

At the Fresno State College the present general education requirement in natural sciences for the bachelor's degree is nine semester hours. This must include at least one course in biological science and one course in physical science, the remaining units may be se-

lected as the student wishes. There is no requirement of a laboratory science. It is possible at this institution for a social science major to have completed the minimum of nine semester hours of natural science including seven units from nonlaboratory courses in physics, geology, chemistry, or meteorology, and two units in the history of biology for the bachelor's degree. This individual might complete the fifth year majoring in social science, including six semester hours of practice teaching in any grade from seven through twelve. On this basis he would be authorized to teach any subject commonly taught in California high schools, grades seven through fourteen, including biology. The responsibility for wise choice of assignment is thus left in the hands of administrators. This study seems to indicate there is room for improvement.

The colleges have set up majors and minors with the object of preparing qualified teachers. The Fresno State College offers majors and minors in biology, in natural science, and in life science with a minor in general science. The credential major in life science and general science requires 36 semester hours work including at least twelve semester hours of upper dvision. This must include:

(1) General botany, 3–5 semester hours.
(2) General zoology, 3–5 semester hours.
(3) Entomology or bacteriology, 4–5 semester hours.
(4) Genetics or heredity and evolution, 2–3 semester hours.
(5) Human physiology, 3 semester hours.
(6) Electives from the fields of chemistry, physics, geology, astronomy, and meteorology, 6 semester hours.
(7) Upper division electives in zoology, including a field course, 7 semester hours.
(8) Upper division electives in botany including a field course, 6 semester hours.

The specific requirements of field courses has drawn criticism from certain members of our own staff. To date they have been maintained. There are those among us who believe that biology is the science of living things and not necrology. Some of us are convinced that the best form of visual education is the natural object in its natural environment.

Careful guidance by staffs of teacher training institutions seems the best means of preparing candidates adequately for high school biology positions. As the increase of postwar enrollment moves upward from the elementary through the secondary schools the problem may become more acute. Under the present form of accreditation there will always be administrators who will hire an athletic coach and assign him to handle academic subjects as immediate needs dictate. Some professional educators have defended the general secondary credential as good job insurance. One young man eager to enter the field of high school biology teaching has indicated that he does not want that type of insurance. There is undoubtedly need for a general secondary credential for staffs of smaller high schools. The State Department of Education might well consider limitations as to types of schools in which such a credential would be valid.

Unless this should happen the staffs of teacher training institutions may be faced with the alternative of generalizing even more the training of secondary school teachers. This alternative is not likely to find favor with some educators.

Within the past week I received a questionnaire containing the following question "Do you think that scholarship is more important in teaching than the

attitude of the teacher toward the student?" Can you imagine good teaching without basic training and without desirable attitudes towards students? Is it not comparable to asking which is more important, air or water, in sustaining human life?

Liberty Hyde Bailey is reported to have told one of his associates that he could enter a rural school room and teach a lesson without preparation. He entered such a school room and taught a splendid lesson centered around a knot hole. It has been pointed out that this able botanist had behind him years of preparation both in natural science and in dealing with his fellow men. Techniques are necessary, and so is basic knowledge, for effective instruction in high school biology. Good guides are familiar with the areas in which they tread. Teachers are guides.

CONDENSED MINUTES OF THE PHILADELPHIA MEETING

There is space this month for only a brief reference to the business portion of the Philadelphia convention. More times were set aside for business sessions than has been the custom, with the result that there was more time for full consideration and discussion of Association affairs.

The important new item in this year's business was that of the National Conservation Project, to which two entire sessions were devoted. Most of the time was spent in organizational matters. The details of the development of the project will be printed regularly in *The American Biology Teacher*.

Much time was spent, as is true of nearly every convention, in the important work of setting up the working committees; a partial list of these appears on the following page. The full membership of some of these will be announced later. The Regional Membership Chairmen were announced last month by Chairman McCafferty.

The new Audio-Visual Education Committee, under the leadership of James M. Sanders, has already sent in much material, some of it appearing in February and another list scheduled for next month. The *Biology in The News* feature, for which a committee headed by Brother H. Charles, long time Associate Editor, has assumed leadership, will appear regularly; it is hoped that this feature may increase the biology teaching usefulness of many of the common magazines found in most homes.

The reports of the officers were given at the first business session, at 8:00 A.M. of the opening day. It is hoped that the details of some of these may appear in the near future. Among these reports was that of the editor-in-chief, in which a change in the general appearance, brought about by the use of a photographic cover picture, was recommended. It is hoped that many readers may derive pleasure and satisfaction from furnishing the cover pictures.

The report of the election committee was made at the luncheon meeting of NABT. The results were announced in the January issue. The new officers assumed their duties at the Philadelphia meeting and are at work.

Cooperation with the American Institute of Biological Societies was discussed, particularly as it might affect the use of our journal in the publication of some of the papers dealing with biology teaching. Many of the biological societies publish occasional papers on the teaching of their various sciences; perhaps *The American Biology Teacher* might be the publication avenue for some of these.

The treasurer's report indicated a need for more revenue. To this end were discussed at great length possible ways and means for increasing both membership and advertising. Increase in both are essential if NABT is to continue to exert its best influence. Further details on both membership and financial problems will appear in later issues.

The increase of interest in science teaching at the elementary level was discussed and it was decided to appoint an associate editor charged with the specific responsibility of obtaining suitable articles dealing with the use of biology in the elementary grades.

BIOLOGY IN THE NEWS

Angels in Your Living Room by Jack Long, *American Mag.*, Feb. 1952, pp. 33 & 103–106.

How raising a tank full of tropical fish provides a really enjoyable way for the entire family to learn many of the wonders of life.

Do You Know You Have Ears? by John D. Radcliff, *American Mag.*, Feb. 1952, pp. 46–47 & 97–100.

Signs of incipient ear trouble and what to do to prevent extensive loss of hearing.

Birds Are Smarter Than You Think by James P. O'Donnell, *Sat. Ev. Post.*, Feb. 16, 1952, pp. 24–25 & 86–92.

The birdmen of Rossitten and interesting facts discovered by this scientific group of bird banders.

London's Amazing Zoo by Oden and Olivia Meeker, *Sat. Ev. Post*, Feb. 23, 1952, pp. 28–29 & 116–121.

A zoo specially adapted to show off the antics of its animals to an interested public.

Killers at Large by George Weinstein, *Redbook*, Feb. 1952, pp. 24 & 72–73.

Dangers arising when persons with active cases of tuberculosis walk out of our hospitals and live among the general population.

Danger—A New Killer Stalks Our Fish and Game by Joseph P. Linduska, *Hunting & Fishing*, March 1952, pp. 28–30 & 80.

An up to the minute account of the effects of DDT and other insecticides on our wildlife.

COMMITTEES

Following is a partial list of NABT committees for 1952. Any members who have suggestions that may be helpful to any of the committees are cordially invited to get in touch with the chairmen right away.

Membership: Robert C. McCafferty, Central High School, Wadsworth, Ohio.

Nominating: Ruth Dodge, 34 East Walnut, Alexandria, Va. (Chm.). Richard L. Weaver, P. O. Box 5424, State College Station, Raleigh, N. C. George Jeffers, State Teachers College, Farmville, Va.

Education and AAAS Cooperative: Prevo L. Whitaker, Indiana University, Bloomington, Indiana.

Liaison: George Jeffers, State Teachers College, Farmville, Va. (Chm.). Richard L. Weaver, P. O. Box 5424, State College Station, Raleigh, N. C. E. L. Palmer, Professor of Nature and Science Education, Cornell University, Ithaca, New York. John Breukelman, State Teachers College, Emporia, Kansas. Leo F. Hadsall, Fresno State College, Fresno, California. John P. Harrold, 110 East Hines Street, Midland, Michigan. Harvey E. Stork, Carleton College, Northfield, Minn. (ex officio).

Conservation and Outdoor Education: Richard L. Weaver, P. O. Box 5424, State College Station, Raleigh, N. C.

Health Education: Sister Claretta, River Forest, Illinois (Chm.).

Constitution and By-Laws: Ruth Dodge, 34 East Walnut, Alexandria, Va. (Chm.). George Jeffers, State Teachers College, Farmville, Va.

Affiliate Groups: Brother H. Charles, F.S.C., Saint Mary's College, Winona, Minn.

Audio-Visual Education: John Sanders, Chicago Teachers College, Chicago, Ill.

LETTERS

. . . As to manuscripts, I am interested in reading any article dealing with the content, method or philosophy of college biology teaching. In this connection may I make a suggestion for a future issue or issues of ABT.

I would like a series of articles, written by college instructors from all types of colleges, which would describe the types of courses given to freshman students. . . . I refer especially to the so-called "general education" or "core curriculum" in biology. Whatever such a course may be called, I think we all agree that we should offer a course or courses in biology designed to meet the needs of freshman students, regardless of the type of training they have had in high school . . . I think a series of articles dealing with such courses would be valuable not only to college teachers, but even more to the high school teacher of biology who is preparing students to enter colleges and universities. Furthermore, this could be a distinct contribution to "biology in general education" which could be and might as well be made by NABT. . . .

Sincerely,

J. A. Trent,
Oklahoma Baptist University,
Shawnee, Oklahoma

Editor,
American Biology Teacher

Dear Sir:

. . . And once again, on behalf of the crippled children of the nation, we are appealing to you for help. March 13, 1952, will launch the 19th Annual Easter Seal Campaign sponsored by the National Society for Crippled Children and Adults, the Easter Seal Society, and its more than 2000 Easter Seal affiliates in the 48 states, District of Columbia, Alaska, Hawaii and Puerto Rico. The campaign closes Easter Sunday, April 13.

Any message you may publish in your March or April issues on behalf of this great drive will help tremendously. . . .

May we thank you . . . for your cooperation. . . .

Sincerely yours,

Lawrence J. Linck,
The National Society for
Crippled Children and Adults,
Chicago 3, Illinois

Dear Mr. Breukelman:

I am enclosing a description of an exhibit which will be on display at the Adelphia Hotel during the NSTA convention. This is in response to a request for biology materials used successfully in the elementary school. Thank you for your consideration.

Cordially,

Flora Kahme,
Port Jefferson Elementary School,
Port Jefferson, L. I., New York

Editor's note: The above letter was received too late to be included in the December issue; it is therefore included here as a part of the coverage of the Philadelphia convention. It should be reported that the exhibit was one of the most popular ones at the hotel. Evidently there is a great deal of interest in biology at the elementary level. The following note was included with the exhibit:

SHOWING ROOT HAIRS

Our Elementary Science pupils have developed a method of showing root hairs. Empty plastic cheese containers, absorbent cotton, white blotters and radish seeds are used.

The procedure is as follows:

1. Put radish seeds in the bottom of the container.
2. Cover with white blotters cut to fit the container.
3. Fill container with wet absorbent cotton.
4. Add a few radish seeds.
5. Place a cover on the container.

This process is repeated each day for one week and at the end of this time we have an easily handled display which can be examined without fear of injury to the root hairs.

Root hairs grown by this method are plentiful and easy to see. Small children like to, and need to, handle objects they are studying. Then can handle the plates, turn them over and pass them around the room without doing much damage to the exhibit.

THE STAFF

In order that readers may know who carries the chief responsibilities in the activities of THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS and *The American Biology Teacher* it is the policy of the journal to publish twice a year, in the November and March issues, a complete list of the staff members. Lists of chairmen and personnel of committees are published in connection with reports of their activities.

All these individuals are deeply interested in the improvement of both the association and the journal. They welcome suggestions from members and are ready to give assistance to anyone interested in writing items or other articles for the journal.

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